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**Drink- and Pour Closure with Pierce-Cutting Facility for Composite Packs
or for Necks of Containers and Bottles, Which are Closed with Foil
Material**

[0001] This invention relates to a drink- and pour closure with pierce cutting facility (henceforth called "d p closure") for opening a composite pack, fitted with it or for opening the neck of a container or bottle, which is closed with a thick foil and which is fitted with such a d p closure. For composite packs, packs made of foil-coated paper are used, in which milk, fruit juices, mineral water and all other kinds of drinks are packed. The paper for such composite packs is a laminate, usually a paper or a board, which is coated with plastic (polyethylene for example) and/or aluminum. Volumes of such packs usually range from 20 cl to 2 liters and more. Alternatively, the pour closure can also be mounted on containers or bottles, whose necks are closed with a thick foil of foil material, somewhat like on all kinds of bottles, made out of glass or PET plastic or similar containers.

[0002] Closures of such type and made out of plastic are known in different configuration. When these are intended to be used in a composite pack, they essentially form a pouring rim or a pouring collar with a shoulder projecting out radially from its bottom edge, the shoulder forming a terminating flange at this edge or collar. In the case of a pouring collar, it is mostly equipped with an external thread, on which a threaded cap can be screwed as closure. In the case of a bottle closure, the pouring collar can be placed or threaded over a bottle mouth. Other pouring closures have a shaped, folding cover, which hinges on an integral hinge. Such a pouring closure is flanged up on the composite pack in such a way that it is tightly welded on the composite pack with the bottom side of its projecting rim, that is, with the bottom side of its flange. The free passage at the bottom end of the rim or the collar of the closure is then closed tightly by the composite laminate of paper and thick foil of the composite pack.

[0003] The foil reinforced paper, passing below the welded collar or the pouring closure or the foil membrane, passing below the collar or the closure, must be cut open, torn open or pushed out for opening purpose, so that the passage becomes clear and the liquid from the container can be poured out or emptied through the collar / end connector or the pouring closure. A sleeve is arranged for this purpose at the inside of the end connector; when the cap is turned to unscrew it, this sleeve is taken up by it and is hence turned in the same direction. Threads running counter to the outer side of the end connector and the inner side of the cap at the inner side of the end connector and outer side of the sleeve, the sleeve moves when the threaded cap is screwed out, that is, continuously downward, when it (cap) is displaced upward opposite to the packing of the liquid. The bottom edge of the sleeve is equipped with one or more tearing or cutting teeth. Through its turning and continuous downward movement, the sleeve is able to push out or cut through a disc from the foil reinforced paper or the local foil membrane, which run below it.

[0004] Such conventional self-opening closures, however, do not always function to one's complete satisfaction. Discs often would not be cut off clean from the paper foil or the foil membrane but the sleeves would push out simply a piece of foil from these. The remaining edge is frayed and consequently shreds of paper or foil project out in the passage, which should really have been kept free. These shreds also often project downward into the container or they project directly in the path of the liquid, which flows out. For larger packs with stronger foil reinforced paper or board, the opening is carried out still less reliably and cleanly. The sleeve, which moves slowly downward, rotating at the same time, touches with its complete bottom edge virtually simultaneously the foil reinforced paper web to be cut, and pushes it totally downward and turns itself on it till a hole is made, more as if it is scraped through or broken through than it is cut. The problem as to why the cutting off does not take place cleanly lies therein, amongst others, that the foil to be cut off gets away downward from the pressure of the sleeve, which acts as a drill bit so to say, with the result that the sleeve no more works on a flat paper foil but on a foil, which is curved downward. On account of the design of the sleeves, which can be naturally described as breaker or penetrator, since they more accurately break a paper foil piece than cut off cleanly a perfectly circular disc, the current practices require a necessary force from the sides of the users. A large turning moment must thus be brought about since the teeth or the tearer at the bottom edge of the breaker or the sleeve first of all scratch the entire periphery and then have to overcome a large turning resistance. At the topmost layer of the thickness of the paper, they work like tearing teeth, which means that they scrape, press and tear rather than work as real cutting blades with sharp cutting edges.

[0005] For the conventional self opening type closures, the foil material or the joining substance are pre-weakened at the intended place of tear by means of laser or a punching tool to make the break-

ing off or tearing off easier. This pre-weakening, however, technically involves considerable expenditure. Costly equipment is required and treatment of the penetration area on the foils is time consuming. In spite of adopting such costly pre-weakening measures, the conventional self-opening closures do not cut cleanly but tear off the paper or plastic foil earlier than cut them cleanly, as is evidenced by the large amount of resistance to turning. On account of this large resistance to turning, the force transmitting device often breaks, which is supposed to transmit the turning moment of the threaded cap to the penetrating sleeve, or the provided follower cams, which engage with the grooves on the penetrating sleeve, jump out from these grooves. When this happens, the self-opening closure is no longer functional.

[0006] A further problem is that the disc of foil, which has been torn off or cut off to some extent by the penetrating sleeve, turns a little downwards or it does not remain turned downwards all the time during the time of use of the closure, since the penetrating sleeve is not securely fixed in its end position. For a proper drink-closure, all these problems should be adequately fixed.

[0007] The configurations, which are known already, are, furthermore, of relatively large built up height. In the case of an end connector, it must take up a penetrating sleeve, which has to be moved down by a few millimeters to open the composite laminate, irrespective of whether the sleeve is then rotated or not. The force transmitting device for pushing it down or setting it in rotation, require much space and a corresponding built up height, which is, however, at a disadvantage for the stackability of the composite packs, which are fitted with the same. Besides, the individual components are complicated in their construction. They are produced separately – as end connector, as cover, which can be unscrewed and also as penetrating sleeve, which can be inserted in the end connector. After getting injection molded, these three parts must be assembled together, which becomes expensive and, for large number of parts, as is the case here, require specially designed and expensive assembly equipment.

[0008] Therefore in order to address this problems and a d p closure for composite packs or for containers, which are closed with foil material, is created, which makes it possible to cut out reliably a disc from a laminate or foil with an internal closure-passage, where clean cutting edges are generated and protruding scraps in the passage are avoided. For a number of foil materials and joining substances, even the intended pre-weakening of the cutting area through laser treatment or punching can be done away with. This drink- and pour closure should be made up of maximum two parts and assembled easily.

[0009] This objective is met by a d p closure for composite packs or for necks of containers- and

bottles, which are closed with a foil material, comprising an end connector/collar with a radially projecting flange below, which is meant for welding on a composite pack or depositing in a composite pack, or comprising an end connector/collar with a formed threaded cap below for screwing on a collar thread and which is characterized by the feature that a mouth or pouring piece is put on the collar, the said piece forming a piercing cutter, suitably passing as nipple on the inner side of the collar, the cutter forming with its bottom rim at least one piercing point and from which at least one cutting edge, rising at an angle to the turning axis of the nipple and swung, is formed and that the mouth- or pouring piece on the outer side of the collar forms a sleeve, which surrounds the collar and is movable at the collar.

[0010] Two advantageous embodiments of this d p closure are illustrated in the Figures in different views. With the help of these Figures, the d p closure and its pierce-cutting facility are subsequently described in detail and the function of the closure and specially the function of its pierce-cutting facility are clarified and explained.

[0011] It is shown in

[0012] Figure 1: The d p closure, to be welded on a composite pack, with open cover cap in perspective view.

[0013] Figure 2: The closure as per Figure 1 with open cover cap in a view, as seen from the side.

[0014] Figure 3: The d p closure as per Figure 1 with open cover cap in a diametric section through the mouth- or pouring piece with its pierce-cutter as well as through the collar with projected flange.

[0015] Figure 4: The d p closure as per Figure 1 with pressed down mouth- or pouring piece in a diametric section

[0016] Figure 5: The d p closure as per Figure 1 with open cover cap and pressed down mouth- or pouring piece and corresponding pierce-cutter, which is rotated downwards.

[0017] Figure 6: The d p closure for screwing on the threaded neck of a bottle or of a container with open cover cap in a perspective view.

[0018] Figure 7: The d p closure as per Figure 6 with open cover cap in a view, as seen from the side.

[0019] Figure 8: The d p closure as per Figure with open cover cap in a diametric section through the mouth- or pouring piece with the pierce-cutter and the threaded cap.

[0020] Figure 9: The d p closure as per Figure 6 with pressed down mouth- or pouring piece, as seen from the side.

[0021] Figure 10: The d p closure as per Figure 6 with open cover cap and pressed down mouth- or pouring piece in a diametric section along the line B-B of Figure 9 and corresponding pierce-cutter, which is turned downwards.

[0022] Figure 11: An alternative pour closure for pasty contents as seen at an angle from below, with opened up cover and turning cap and before the first opening, that is with the guarantee strip intact.

[0023] Figure 12: The pour closure for pasty contents as per Figure 11 as seen at an angle from above, with opened up cover and turning cap and before the first opening.

[0024] Figure 13: The end connector/collar with threaded cap for pour closure for pasty contents as per Figure 11, as seen at an angle from above.

[0025] Figure 14: A d p closure as seen at an angle from below, with opened up cover and turning cap and before the first opening, that is with the guarantee strip intact.

[0026] Figure 15: A d p closure as in Figure 14 as seen at an angle from below, but with threaded cap.

[0027] Figure 16: The d p closure as per Figure 15 as seen at an angle from above, with opened up cover and turning cap and before the first opening, that is with the guarantee strip intact.

[0028] The d p closure with open cover cap is shown in perspective view in Figure 1. It comprises altogether only two parts, which can be assembled together, namely an end connector 1 with a projected bottom rim 5, which constitutes a flange, by which the closure can be tightly welded on a composite pack, and a mouth- or pouring piece 2, which can be placed over this end connector 1 and on which an one-piece cover cap 3 is further formed through a flexible safety strip 4. At its bottom side, it has a sealing lip so that, when pressed on the opening of the mouth- or pouring piece, it acts as a dust and sealing cap. The mouth- or pouring piece 2 forms a ring with projected, round rim 6. A sleeve 7 projects downward below the rim 6 and below the sleeve 7, a continuously running band 8,

with its external side aligned with the sleeve, is formed over several material bridges, which are laid as breaking points. This band 8 acts as safety and guarantee strip, as would be made clear. As long as this band 8 lies on the sleeve 7, the d p closure cannot be opened.

[0029] In Figure 2, the d p closure as per Figure 1 is shown from the side, but before it was opened for the first time. One can recognize here the projected, round rim 6 of the mouth- or pouring piece 2 and the sleeve 7 joining below, against which the projected rim 6 of the mouth- or pouring piece 2 is supported by several strengthening ribs 9, which run in a radial plane with respect to the sleeve 7. Below the sleeve 7, connected to the bottom edge of the sleeve through fine material bridges 10 and continuing to certain extent downward, is band 8, which is formed in the shape of a tongue at the end of its run. Outwardly projecting flange 5, which is a part of the collar of the closure (not visible here), can be identified below the band 8. The cap cover 3 is open and it always hangs on the elastic flexible safety strip 4. By bending the safety strip 4, the cap cover can be put on the mouth- or pouring piece 2. A sealing collar 12 with sealing lip is formed at the inner side of the cap cover, which fits drip proof into the internal width of the mouth- or pouring piece 2.

[0030] Figure 3 shows this d p closure in a diametric section through the mouth- or pouring piece 2 with its pierce-cutter 13 and the collar 14, which is a part of the closure. The collar 14 with its projected rim at bottom, which forms a flange 5, is welded in a leak-proof way on a composite pack. The mouth- or pouring piece 2 is put on this collar 14, which includes a special pierce-cutter 13. This pierce-cutter, in principle, comprises a nipple, which is formed as pointing downward on the mouth- or pouring piece 2 and fits into the internal width of the collar 14. The external sleeve 7 over the mouth- or pouring piece 2 is thereby turned up. One can identify the continuously running strip 8 below the bottom edge of this sleeve 7, the strip being held by few small material bridges at the bottom edge of the sleeve 7 and preventing for the time being a pressing down of the mouth- or pouring piece on the collar. It therefore acts as safety- and guarantee strip and also ensures a guarantee against a "first opening." So long as this strip (band) 8 is not torn off from the bottom edge of the sleeve 7, the closure cannot be opened, as becomes clearer in further description. As can be seen, the collar 14 has a small overhang 15, projecting inwards, at its upper edge and the nipple, which makes the pierce cutter 13, has on its outer side a small projecting step 16, pointing upward. During its assembly on the collar 14, the mouth- or pouring piece 2 is pressed and thus the step 16 with its surface, which is beveled downward, slides over the projected rim and the step 16 works afterwards as a barb in a way, so that the mouth- or pouring piece 2 can no longer be pulled away from the collar 14 and is held securely and drip-proof on the same. At the lower portion of the nipple, which forms the pierce-cutter 13, one can see its downward-swung edge 18, progressively getting

steeper, forming the sharp cutting edge. At two preferred spots, the bottom edge 18 runs into a point 17 in the sense that it runs upto these points 17 with its downward-swung bottom edge. To open this drink-closure, the guarantee strip 8 must first be torn off and removed completely, whereby it can get seized at the tongue 11. Only when this guarantee strip 8 is totally removed, the mouth- or pouring piece 2 can be displaced downward. For this purpose, it is pressed downward with some force so that the pierce-cutter 13 pricks the composite pack or the thick foil under it and when it is pressed down further under enforced rotation, it cuts up along the inner edge of the collar 14 with its swung, sharp edge 18, through which, the closure and the thick foil lying under it, are opened. It is not imperative, however, that the mouth- or pouring piece is twisted, when it is pressed down on the collar 14. A guide can also be provided, along which the mouth- or pouring piece with its lower, sharp edge 18 can merely be pressed down axially in the collar without any rotation, thereby cutting up the thick foil underneath. A locking device is formed between the pierce-cutter and the collar, so that the pierce-cutter 13 gets locked on the collar 14 in the position, where it has been rotated down and remains so.

[0031] In Figure 4, an enlarged view of the mouth- or pouring piece 2 with pressed down pierce-cutter 13 is shown and, with reference to Figure 3, it is shown as seen from the right side so that the cover cap 3 is at the back of the mouth- or pouring piece 2. The step 16, formed externally on pierce-cutter/nipple 13, can be better seen here as well as the inward projection 15 at the upper part of end connector/collar 1. Further, the guiding device can also be seen here, on the strength of which, the mouth- or pouring piece 2 experiences a turning moment when it is pressed down, so that the entire mouth- or pouring piece 2, together with the pierce-cutter 13, twist simultaneously by 90 to 180 degrees when the same is axially pressed down. This guiding device comprises two helical grooves 19, which are carried on the outer side with steep gradients and in which two appropriate cams 20 run or glide, these cams being formed at the mouth- or pouring piece 2 on the inner side of the bottom rim of the external sleeve 7. The pierce-cutter 13, as shown here, have two points 17 for piercing the composite laminate or the thick foil and these are connected with each other over the swung, sharp edges 18. The two points are arranged somewhat shifted on the periphery of the pierce-cutter sleeve 13 and are not intentionally positioned at 180 degrees to each other. The pierce-cutter 13 pierces the foil at two places when the mouth- or pouring piece 2 is pressed down and further cuts it immediately as the same is turned. The amount, by which the pierce-cutter 13 is rotated, is determined through proper designing of the guiding device, that is, through choosing the gradient of the groove 19 and the rotation it provides, in such a way that the cut-off disc finally is kept hanging at one place on the composite material; this ensures that the almost completely cut-off disc

from the composite material by the pierce-cutter 13, swings downwards but is still held by a small material connection, so that it does not fall in the composite pack.

[0032] In Figure 5, the d p closure with pressed down mouth- or pouring piece 2, as seen from the side, is shown. The guarantee strip was first torn off and then the mouth- or pouring piece 2 with the cap 3 still put on, could be pressed down by pressing on top. The points 17 of the pierce-cutter 13 first puncture the composite pack or the thick foil, which lie under the closure and then, when the pouring piece 2 is pressed down further, they inevitably rotate themselves together with the cover cap 3, through which the pierce-cutter 13 cuts open the composite pack or thick foil further along the inner edge of the collar, till finally the cutter 13 takes up its shown end position and the disc, which is almost completely cut off, swings downward.

[0033] Figure 6 shows a functionally identical drink closure, whose collar flange is integral in a threaded cap 21. In Figure 7, this drink closure, as seen from the side, is shown, where the 'first opening' intact guarantee strip 8 and tongue 11 for tearing off this strip 8 are shown. In Figure 8, this drink closure with threaded cap 21 is shown in a diametric section, as seen from the side, but with the exception of cover cap 3. The cover cap 3 acts here also as dust and sealing cap such that when the closure is not in use, it can be closed in a drip-proof way. The closure is made exactly in the same way as the closure, which has been illustrated in Figures 1 to 5 with the sole exception that here a threaded cap 21 has been brought about or, as the case may be, the closure's collar is formed on the top side 22 of a threaded cap 21, which, so to say, makes the overhang on collar/ end connector 1. Screw threads 23 can be noticed inside the threaded cap 21. In figure 9, this drink closure is shown after the "first opening" guarantee strip has been torn off and also after the mouth- or pouring piece 2 has been pressed down, the pouring piece 2 having been now compulsorily pressed down through rotation until it impacted the upper side 22 of the threaded cap 21. In Figure 10, the d p closure is shown in a diametric section along line B-B of Figure 9 and as seen from right of Figure 9. The cover cap 3 is therefore found in this sectional view behind the mouth- or pouring piece 2. The guiding device for forced rotation of the mouth- or pouring piece 2 and the pierce cutter 13, formed below it, are the same as already described for the embodiments in Figures 1 to 5.

[0034] In Figure 11, an alternative embodiment of such a pour-closure has been shown, which is specially suited for pasty contents, having consistency of mayonnaise or similar substances. This closure is shown, as seen at an angle from bottom, with opened cover- and turning cap 3 and before the first opening. This closure likewise comprises an end connector, which is here, however, not seen and also a pouring piece 2, which has a dome shaped upper end, which is opened through diametric

incisions 24. Inside and at its lower side, the pouring piece 2 runs into a pierce cutter 13, which has a sharp bottom edge 18. The edge forms here three cutting points 17, which are distributed around the periphery of the pierce cutter 13. Besides, the pouring piece 2 forms at its lower side a sleeve 7, which surrounds the pierce cutter 13, maintaining a gap. On the outer side of the pouring piece 2, a rim 25 is formed, which is connected with the guarantee strip 8 through few fine material bridges. On the guarantee strip 8, furthermore, a tongue 11 is formed, which is gripped and through breakage of the material bridges at rim 25, it can be torn off from the pouring piece 2. Above rim 25 on the pouring piece 2, a toothed rim 26 is formed, which makes a kind of gear wheel and whose functioning is made clearer through the drawings, which are given ahead.

[0035] In figure 12, this pour-closure for pasty contents is shown, as seen at an angle from top. As one can recognize here, the dome shaped tip of the pouring piece 2 is opened by a number of diametric incisions 24. They join at the center of a pour opening 29. The cover and the cover cap 3 here is opened through the integral hinge 27. At its inner side, the cover – and turning cap 3 is shaped into a toothed inner surface 28 at its bottom or along its opening. These teeth match exactly with those of the toothed rim 26 on the end connector 2. The cover- and turning cap 3 is held through an integral hinge 27. When the cover- and turning cap 3 is folded on the pouring piece 2, the teeth along its inner face engage with the teeth of the toothed rim 26 on the pouring piece 2. Now when the cover- and turning cap 3 is turned, the pouring piece 2 and, consequently, the pierce-cutter (not visible here), which is built at its lower side, is also turned. Merely such a turning is not able to open the closure, since the pierce-cutter also must be further moved downwards. For this purpose, it is necessary that the guarantee strip is first torn off. One holds the strip at the tongue 11 and tears it apart from the pouring piece 2, after breaking the fine material bridges 10. Now the pouring piece 2 on end connector 1 can be moved downwards by rotating the cover- and turning cap, which has been put on it.

[0036] Figure 13 shows the end connector 1 singly, as seen at an angle from top. As one can see, a helical groove 19 is take out on its outer side, in which special cams, which are provided on the sleeve 7 at the bottom side of the pouring piece 2, engage and when the pouring piece 2 is pressed down on the end connector 1, forces the same into a rotation. But the real turning moment at the pierce cutter is then generated, when the cover cap with its toothed lower inner rim engages with the external, toothed rim on the pouring piece 2 and the pierce cutter on the pouring piece can be rotated forcefully, when the knurled outer face of the cap is rotated. A threaded cap 21 joins here at the bottom side of end connector 1, by means of which the closure can be screwed on the threaded

collar of a container or a bottle.

[0037] Figure 14 shows an embodiment, in which the pouring piece 2 is formed as a pouring- or drinking collar. Otherwise it is no different from the ones as in the Figures 11 to 13. Only the upper part of the pouring piece 2 here is shaped differently. In place of a dome shaped upper end, a tubular end piece with blunt edge is used here. On one hand, this can be used for pouring out the contents of a container or bottle, and also for putting it to the mouth for drinking straight from a bottle. Figure 15 shows this d p closure, as seen at an angle from bottom, with opened cover- and turning cap and Figure 16 shows it at an angle from top. One can recognize here clearly the formation of the pouring- or drinking piece 2 with its blunt edge and also the toothed border 26 on the pouring- or drinking piece 2 on one side as also the toothing 28 on the inner side of the accompanying cover cap 3.